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Docket Number 212/01936

PROVISIONAL APPLICATION FOR PATENT COVER SHEET (Small Entity)

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53 (c).

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TITLE OF THE INVENTION (280 characters max)

IMPLEMENTATION OF SATELLITE AND AGGREGATION POINTS MODEL

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ENCLOSED APPLICATION PARTS *(check all that apply)*

☒ Specification	*Number of Pages*	5	☐ Small Entity Statement	
☐ Drawing(s)	*Number of Sheets*		☐ Other (specify)	

METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT *(check one)*

☐ A check or money order is enclosed to cover the filing fees

☒ The Commissioner is hereby authorized to charge filing fees or credit any overpayment to Deposit Account Number: 03-3419

FILING FEE AMOUNT: $75.00

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

☒ No.

☐ Yes, the name of the U.S. Government agency and the Government contract number are: ______

Respectfully submitted,

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USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

***SEND TO:** Box Provisional Application, Assistant Commissioner for Patents, Washington, DC 20231*

Implementation of Satellite and Aggregation points model

A multi-cast based data distribution system (hereafter "bandwiz system") is described, for example, in a US provisional patent application serial number 60/179,926, a US provisional patent application serial number 60/217,139, an Israel application having serial number 138114 and an Israel application having a serial number 137624, the disclosures of which are incorporated here-in by reference.
An exemplary described system uses a FEC erasure code to multicast information to clients. The content of the multicast packets is determined, for example, based on statistics of requests made by the clients, from web servers, from which the data is retrieved for multicasting.

In this disclosure we describe way to have a distributed implementation where there are data pumpers (or even Bandwiz server or other server) at a local ISP. The local servers are called aggregation points. The data to the aggregation points is delivered from the content providers or from any other main Bandwiz server by another multicast network. This multicast network should have a global span, and it can typically be implemented over satellite network.

Below we describe what is needed in an exemplary system to convert a Bandwiz system into the satellite and aggregation points model. A specification of an exemplary system according to this model is also given in the attached Appendix.

In the sequel, we want to distinct between two things:

- "Reports" – whose goal is to give the content provider a reliable and accurate measure about how many users downloaded each URL, or each page.
- "Real-Time statistics" – gives the aggregation point the information to decide which content group should be multicasted.

With this exemplary implementation, assuming that the protocol for the client is defined properly, there is no need to modify the client when changing models. Also, we are still non-intrusive to the original HTTP server.

Original HTTP server

- No changes, i.e., contains an HTTP redirection for the ACTIVE record to the transmission center.

Transmission Center

- May be singleton – Gives service for the entire world.
- Knows about all aggregation points and their state. Check them from time to time using **ping** or some higher layer protocol.
- Gives the ACTIVE record to the clients depending on their IP address, using HTTP. The ACTIVE gives the client information on the aggregation point near it.
- Only this component is allowed to connect to the original HTTP server. Contains the HTTP fetcher, and content builder blocks.
- Accepts aggregated reports in order to decide which new content group it should create, and in order to report the content provider and the network manager.
- Decides about the next content group to build, using aggregated reports. This is complex process, because we have a single satellite link for a lot of content providers, meaning, that we need to support minimum rate for everyone, and give more if they will pay for that using some priority scheme.
- Sends build content groups once (without carousel) through the satellite. Each content group has a digitally signed "lease" with a QoS specification and expiration time. Also, sends digitally signed notification about obsolete leases and extended leases.

Aggregation Point

- Gives service to all content providers inside a multicast area.
- Listen to the satellite for new content groups, and store them on the local disk. Has a medium size cache for these content groups. Listen for obsolete leases and extended leases, for immediate disposal if the lease expired.
- Contains reporting center, which aggregates reports and sends them periodically (30 seconds?) to the transmission center using persistent TCP connection. This contains also URLs that are not accelerated, so, the transmission center can build content group for them.
- Contains local real-time statistics center, which decides locally about which are the content groups to accelerate. In any case, will not multicast data if it does not have a valid "lease" for it.
- Reports about the current content groups being multicasted.
- Again, this is complex because we support a lot of content providers. Each content provider has its own requirements about QoS for it's resources, and we might have some bandwidth we can give to any of the clients.

Client

- No changes, i.e., gets the ACTIVE record for the original HTTP server, which redirects it to the transmission center, which gives the ACTIVE of the aggregation point, and works from there. Probably the active will point for the same server for all sources, but the client should not assume that.

Browser

- No changes, i.e., configured the client to be the HTTP proxy.

Additional topics:

- We may give acceleration services to clients outside of any multicast domain (reliable-UDP or encoded HTTP).
- Can make a clean distinction between content groups and download information. Each aggregation point builds it's own download information, while the content groups are created and signed only in the transmission center. I need to check all the protocols to see if they are implemented this way.
- We may support multiple websites acceleration. This will be implemented in this way: "http://www.cnn.com/__BW/ACTIVE" will be an HTTP redirection to "http://www.bandwiz.com/__BW/cnn.com/ACTIVE". From that point, the client will see these active records as totally distinct.
- Notice that we can do without this redirection: We can ask some central server about the entire list of sites accelerated by us. In this case, we are not intrusive at all. This makes sense in the service model.
- We need to define the format of the "lease". The signature is simple, but the QoS requirement from the aggregation point is complex. Keep in mind that the aggregation points may not created equal (different Internet connection, different number of users in the multicast island, different number of users using reliable UDP or encoded HTTP, different disk size, different computing resources).

Claims:

- 1. A system for content delivery, where the content is coded, and partially overlapped requests are transmitted by multicast. The multicast is implemented in two hops. At the end of one hop, there is a memory (cache) that stores the content for further transmission by multicast to the end user.
- 2. A system as in 1 where the first hop is implemented by satellite transmission.

Appendix: Specification of an exemplary Distributed (Aggregation points) System

Root Content Distribution Point (Root CDP)

- One per website, located at the backbone (but can distribute more than one website).
- Redirect users to edge CDP.
- Master statistics gathering and reporting.
- Content fetching, packaging and distribution to edge CDPs.
- Sends content update to edge CDPs / end-users, according to statistics, using:
  - Satellites and/or other multicast links.
  - Application-layer multicast.
  - Multiple unicast streams.

Edge Content Distribution Point (Edge CDP)

- Usually located at access ISP, major network congestion point, or as a cluster node near the root CDP.
- Infrastructure is multicast enabled to the end-users. (Using paket duplicators can imitate multicast, if required).
- Characteristics:
  - Global content redirection, and directory services.
  - Statistics gathering and propagation.
  - Independent storage interface:
    - Proactive cache updates for standard caches, for the benefit of users without Bandwiz clients.
    - Storage of Bandwiz packaged content for redistribution.
  - Multicast broadband services, according to local statistics:
    - Local content.
    - Redistribution of global content.
  - Billing, Security, Authentication, etc.

Client on end-user devices (desktop, web appliance, etc.)

- For each user, maximal benefit requires installation of Bandwiz client on it's desktop / browsing device.
- Interactive broadband web browsing, through utilizing near one-way protocol.
- Intercepts all standard browsing traffic (HTTP), including:
  - Normal HTML pages, with text, images, etc.
  - Streaming of audio, video files (like MP-3, QuickTime).

- Characteristics:
  - Content redirection.
  - Content Pre-fetching.

    - Anonymous statistics gathering and propagation.
    - Internal storage.
    - Interruptible download services, from multiple servers / layers.
    - Billing, Security, Authentication, etc.
- Network friendly, TCP-friendly, congestion avoidance.
- Fallback to normal HTTP if content is not accelerated, or, if something goes wrong.

Some Advantages (comparing to current HTTP usage)

- Scalable content delivery system:
    - Saves bandwidth, comparing to the current caching solutions.
    - Saves computing resources (CPU, memory, storage), comparing to future optimal hierarchical caching.
    - Thus, enabling scalable broadband content delivery.
- Better user experience, due to improved latency – near one-way protocol.
- Content pre-fetching.
- No website "peak" load behavior – enables expected QoS.
- Scaleable over all network mediums, including Satellites, Cables and Wireless, due to Bandwiz transport protocols asymmetric nature.
- Preserves content consistency with source:
    - Up-to-date content.
    - Fast update time.
    - Billing, Security, Authentication, etc.
- Reporting and statistics, like the current unicast model (using HTTP), which includes:
    - Number of hits per URL, page, site.
    - Bitrate at the users per URL, page, site.
    - Bitrate at the server per URL, page, site.
    - Number of concurrent users.
    - Etc.
- Manageability:
    - Adaptive, policy based system, for optimizing transport.
    - Quality of Service (QoS).
    - Configuration of network elements.
    - Monitoring of network elements within content delivery path.